

## LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory April 14-18, 2014.

### SCIENTIFIC AMERICAN™ NATURAL AIR CONDITIONING



**LLNL scientist Benjamin Santer and his climbing group ascend Mount St. Helens via the "Dogshead Route" in April 1980, about a month before its major eruption. The group was one of the last to reach the summit of Mount St. Helens before it erupted.**

This year's eruption of Mount Kelud injected a small amount of sulfur dioxide 28 kilometers into the stratosphere. Tiny droplets of sulfuric acid then reflected away incoming sunlight, helping to cool the planet.

Such "small" volcanic eruptions -- along with others at places like Manam, Soufriere Hills, Jebel at Tair and Eyjafjallajökull, to name a few of the 17 between 2000 and 2012 -- have helped slow the pace of global warming.

"The uptick in early 21st-century volcanism clearly was a contributing factor to the hiatus," says atmospheric scientist Benjamin Santer of Lawrence Livermore, lead author of a recent report. The volcanoes did not act alone. There was also an unusually quiescent sun, air pollution from China's coal-fired power plants and the mysterious workings of the ocean. Santer adds, "The net impact was to offset part of the human-caused greenhouse gas warming."

To read more, go to [Scientific American](#).



## THE SALT OF THE OCEANS



**This prototype, shown next to a glass of water for scale, provides one stage of desalination and can be coupled with more modules, depending on the level of desalination desired.**

Scientists have a new way to take the salt out of seawater.

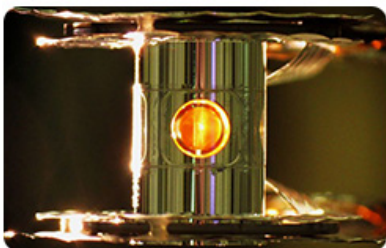
LLNL's Michael Stadermann is working on a process called flow-through desalination. It works like a sponge with magnets inside to attract salt. As the water flows through, the salt is sucked up.

The technology uses aerogel, which has microscopic holes inside. "Now you can push out the water that is in the electrode, and that's your drinking water," Stadermann said.

To see more, go to [CBS](#).



## GIVING TIME TO SCIENCE



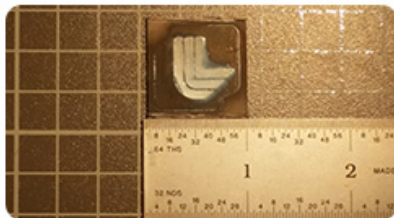
**A metallic case called a hohlraum holds the fuel capsule for NIF experiments.**

The National Ignition Facility (NIF) recently announced a scientific breakthrough in the quest for ignition, which is energy gain from a controlled nuclear fusion reaction. The breakthrough came when NIF scientists were able to create more energy from a fusion reaction than was deposited into the hydrogen fuel used in the experiment.

Tim Frazier, NIF's chief Information officer, recently opined about how scientists need time to do ground-breaking science.

And while the recent findings move toward the goal, it was the result of years of research and a significant step toward the goal. "As the chief Information officer, it's my team's responsibility to help expedite those breakthroughs -- by maximizing the time our scientists spend doing science," Frazier said. "This means finding the right technology and infrastructure to give them more time to work on their research and spend less time waiting to access their data. "

To read more, go to [Forbes](#).



**This proof-of-concept logo was 3D printed using a new additive manufacturing process, light-directed electrophoretic deposition (EPD).**

Since its introduction in 1917, electrophoretic deposition (EPD) has been a popular industrial process for applying coatings to metal and conductive components. Although the process is economical and adaptable, it has always suffered from one fatal flaw: It can only deposit a coating across an entire surface, rather than on specific regions of a part.

While over the last century EPD has been used to apply coatings to entire automotive and aerospace components, new research suggests that the coating technique could be made to dynamically apply finishes to specifically chosen regions.

According to Andrew Pascall, research engineer at Lawrence Livermore: "We have presented a novel electrophoretic deposition technique based on using light to pattern materials on a

photoconductive layer. This represents a large step in advancing electrophoretic deposition as a method of fabricating complex 3D patterned composites."

To read more, go to [Engineering.com](http://Engineering.com).



## CAPTURE THAT CARBON DIOXIDE



**National laboratory scientists are working on capturing CO<sub>2</sub> from the flues of coal-fired power plants.**

Removing carbon dioxide directly from the air is one option to help quell climate change. The failure to reduce greenhouse-gas emissions will likely require countries to organize such massive efforts -- called carbon-dioxide removal (CDR) techniques -- or face temperatures rising more than the 3.6 degrees Fahrenheit above pre-industrial levels.

But simply removing carbon dioxide that is already in the atmosphere may not be as economical as capturing it at its source, according to Lawrence Livermore senior scientist Roger Aines.

The country's national laboratories are not focused on researching direct air capture (DAC), Aines said, but rather on capturing CO<sub>2</sub> produced at power plants. While most agree that line of research is essential, it doesn't remove existing CO<sub>2</sub> from the atmosphere; it only prevents the world from adding more. Advancing those power plant technologies ultimately adds to the understanding of DAC, he said.

To read more, go to [Al Jazeera America](http://AlJazeeraAmerica.com).

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#)